PATENT ABSTRACTS OF JAPAN

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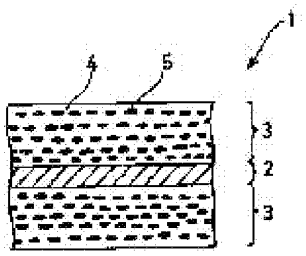
(71)Applicant : **KITAGAWA IND CO LTD**

(72)Inventor : **KITAGAWA KOJI**

(54) ELECTROMAGNETIC WAVE INTERFERENCE SUPPRESSOR



(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an electromagnetic wave interference suppressor which has the same shielding effect with a conductive shielding material on electromagnetic waves so as not to increase electromagnetic coupling caused by reflections of electromagnetic waves by a method wherein an insulating soft magnetic layer which contains pure iron and organic binder is provided to the one surface of the conductive support of the electromagnetic wave interference suppressor.

SOLUTION: An electromagnetic waver interference suppressor 1 is equipped with a conductive support or a conductive soft magnetic support 2 and insulating soft magnetic material layers 3 each provided to both sides of the conductive support 2. The insulating soft magnetic material layer 3 contains flat or needle soft magnetic powder 5 and organic binder 4. At this point, the soft magnetic powder 5 is formed of pure iron. The soft magnetic powder 5 is formed of PC permalloy of physical properties which meet following formulas, maximum permeability ≥45000(μ m), initial permeability ≥30000(μ i), and coercive force ≤0.015(Oe). The conductive support is formed of a copper thin plate, a stainless steel thin plate, or the like, and polyester resin or epoxy resin is used as organic binder.

CLAIMS

[Claim(s)]

[Claim 1]An electromagnetic-wave-interference repressor which is provided with the following and characterized by said soft magnetic material powder being pure iron in an electromagnetic-wave-interference repressor in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder.

A conductive substrate of an electromagnetic-wave-interference repressor which controls electromagnetic interference.

An insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at least.

[Claim 2]An electromagnetic-wave-interference repressor which is provided with the following and characterized by said soft magnetic material powder being a permalloy more than the maximum permeability 450000 (micrometer) in an electromagnetic-wave-interference repressor in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder.

A conductive substrate of an electromagnetic-wave-interference repressor which controls electromagnetic interference.

An insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at least.

[Claim 3]An electromagnetic-wave-interference repressor which is provided with the following and characterized by said soft magnetic material powder being PB permalloy more than the maximum permeability 150000 (micrometer) in an electromagnetic-wave-interference repressor in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder.

A conductive substrate of an electromagnetic-wave-interference repressor which controls electromagnetic interference.

An insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at least.

[Claim 4]In an electromagnetic-wave-interference repressor which is equipped with the following and in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder, An electromagnetic-wave-interference repressor, wherein, as for said soft magnetic material powder, more than the initial permeability 8000 (mui) is [more than maximum permeability 150000 (micrometer)] PB permalloy below coercive force 0.05 (Oe).

A conductive substrate of an electromagnetic-wave-interference repressor which controls electromagnetic interference.

An insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at least.

[Claim 5]In an electromagnetic-wave-interference repressor which is equipped with the following and in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder, An electromagnetic-wave-interference repressor, wherein, as for said soft magnetic material

powder, more than the initial permeability 30000 (mui) is [more than maximum permeability 450000 (micrometer)] PC permalloy below coercive force 0.015 (Oe).
A conductive substrate of an electromagnetic-wave-interference repressor which controls electromagnetic interference.
An insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at least.
[Claim 6]Claims 1-5 are the electromagnetic-wave-interference repressors, providing in a field a dielectric layer of said insulating soft magnetic material layer containing dielectric powder and an organic binder on the other hand at least in an electromagnetic-wave-interference repressor of a statement either.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to the electromagnetic-wave-interference repressor used in order to control the electromagnetic interference produced by interference of unnecessary electromagnetic waves in a high frequency region about an electromagnetic-wave-interference repressor.
[0002]
[Description of the Prior Art]Although the electronic equipment (electronic device) using high frequency, such as digital electronic equipment, is used from the former, spread of the communication equipment which use semi- microwave especially is remarkable. For example, especially the mobile communications equipment represented by the cellular phone has the strong demand of a miniaturization and a weight saving, and let high-density-assembly-ization be a technical technical problem.
[0003]Therefore, since improvement in the speed of signal processing is attained by the electronic parts and the printed wiring which were mounted overcrowded, in them, the interference by the increase and radiated noise of combination between lines by electrostatic **** inductive coupling, etc. arose, and normal operation of electronic equipment has been barred in them. Inductive coupling, spurious radiation or an electric conduction noise etc. which connects a low pass filter etc. for every output terminal of a circuit conventionally, controls the unnecessary high frequency current, or devises a policy which keeps away the circuit which poses a problem to such electromagnetic interference, and causes electromagnetic interference is controlled.
[0004]Further, a weight saving is carried out, as the concrete plan, a power circuit and a small signal circuit are made intermingled in one printed-circuit board, or a small board is formed for every circuit, for example, and, as for these high frequency electronic equipment, many miniaturizations and means to pile up and mount them are taken.
[0005]
[Problem(s) to be Solved by the Invention]However, when two or more wiring boards are piled up and mounted, a possibility that the electromagnetic interference resulting from the electromagnetic wave interference between parts and between wiring boards will be encountered becomes high, and a measure is needed. Generally as an electromagnetic-wave-interference measure means between these wiring boards,

inserting the conductive shield material of a copper plate or an aluminum plate between wiring boards is performed. In the wiring board, since component-mounting density is high, the high-frequency field wave serves as low impedance to the noise source, and the mutual interval of a wiring board also approaches and is arranged.

[0006]Therefore, although while becomes a noise source and the shielding effect over the wiring board of another side which counters a wiring board can be expected, to the same substrates face, reflection of spurious radiation arises and there is a problem that secondary inductive coupling is promoted within the same wiring board by the side of a noise source.

[0007]Then, an object of this invention is to have a shielding effect equivalent to a conductive shield material to the penetration of electromagnetic waves, and to provide the electromagnetic-wave-interference repressor which does not make the inductive coupling by reflection of electromagnetic waves promote.

[0008]

[The means for solving a technical problem, an embodiment of the invention, and an effect of the invention] To achieve the above objects, made this invention, The conductive substrate of the electromagnetic-wave-interference repressor according to claim 1 which controls electromagnetic interference like, It has the insulating soft magnetic material layer of this conductive substrate provided in the field on the other hand at least, and is characterized by said soft magnetic material powder being pure iron in the electromagnetic-wave-interference repressor in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder.

[0009]The conductive substrate of the electromagnetic-wave-interference repressor in which the invention according to claim 2 controls electromagnetic interference, It has the insulating soft magnetic material layer of this conductive substrate provided in the field on the other hand at least, and is characterized by said soft magnetic material powder being a permalloy more than the maximum permeability 450000 (micrometer) in the electromagnetic-wave-interference repressor in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder.

[0010]Here, as for the conventional permalloy, more than the maximum permeability 30000 (micrometer) of PB permalloy is more than the maximum permeability 120000 (micrometer) of PC permalloy. Therefore, the especially large thing of maximum permeability is used also in a permalloy. The conductive substrate of the electromagnetic-wave-interference repressor in which the invention according to claim 3 controls electromagnetic interference, It has the insulating soft magnetic material layer of this conductive substrate provided in the field on the other hand at least, and is characterized by said soft magnetic material powder being PB permalloy more than the maximum permeability 150000 (micrometer) in the electromagnetic-wave-interference repressor in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder.

[0011]Here, the conventional PB permalloy is more than the maximum permeability 30000 (micrometer). Therefore, an especially large thing of maximum permeability is used also in PB permalloy. A conductive substrate of an electromagnetic-wave-interference repressor in which the invention according to claim 4 controls electromagnetic interference, In an electromagnetic-wave-interference repressor which has the insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at

least and in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder, As for more than the maximum permeability 150000 (micrometer), said soft magnetic material powder is characterized [more than initial permeability 8000 (mui)] by being PB permalloy below coercive force 0.05 (Oe).

[0012]Here, as for the conventional PB permalloy, more than the initial permeability 3000 (mui) is [more than maximum permeability 30000 (micrometer)] below coercive force 0.17 (Oe). Therefore, inside ** of PB permalloy is also an especially large thing of maximum permeability and initial permeability, and, moreover, what has low coercive force is used.

[0013]A conductive substrate of an electromagnetic-wave-interference repressor in which the invention according to claim 5 controls electromagnetic interference, In an electromagnetic-wave-interference repressor which has the insulating soft magnetic material layer of this conductive substrate provided in a field on the other hand at least and in which this insulating soft magnetic material layer contains soft magnetic material powder and an organic binder, As for more than the maximum permeability 450000 (micrometer), said soft magnetic material powder is characterized [more than initial permeability 30000 (mui)] by being PC permalloy below coercive force 0.015 (Oe).

[0014]Here, as for the conventional PC permalloy, more than the initial permeability 30000 (mui) is [more than maximum permeability 120000 (micrometer)] below coercive force 0.020 (Oe). Therefore, also in PC permalloy, it is an especially large thing of maximum permeability and initial permeability, and, moreover, what has low coercive force is used.

[0015]the invention according to claim 6 -- either of claims 1-5 -- on the other hand in an electromagnetic-wave-interference repressor of a statement, a dielectric layer of said insulating soft magnetic material layer containing dielectric powder and an organic binder was provided in a field at least According to this invention, an electromagnetic-wave-interference repressor makes basic constitution that by which an insulating soft magnetic material layer was provided in one side or both sides of a conductive base material (conductive substrate). That is, when two or more wiring boards pile each other up and are mounted, by inserting an electromagnetic-wave-interference repressor between wiring boards, in while, a conductive base material serves as a noise source, a shielding effect works to other wiring boards which counter a wiring board, and electromagnetic wave interference is controlled.

[0016]An increase of inductive coupling by reflection of spurious radiation produced by inserting a conductive base material between wiring boards on the other hand is controlled by insulating soft magnetic material layer which consists of soft magnetic material powder and an organic binder. This insulating soft magnetic material layer is an insulating layer by carrying out detailed disintegration of the soft magnetism metal which is a conductive substance, kneading it, and originally, distributing with an insulating organic binder, and. Since an impedance match with space is planned by mixing to a soft magnetism layer of dielectric powder in which a dielectric layer does not exist, reflection of spurious radiation in a soft magnetism layer surface becomes difficult to take place.

[0017]In this electromagnetic-wave-interference repressor, as a conductive substrate, After giving a detailed break to metallic thin plates, such as a copper thin plate, stainless steel sheet metal, and aluminum sheet metal, and a punching metal which performed a detailed perforating process to them, or sheet metal, what is called an extract band metal that carried out the stretching process, or a wire gauze which

processed a conductor of thin line state into mesh shape can be used.

[0018]Since a rise of electromagnetic-compatibility depressor effect in comparatively low frequency is especially expectable if it replaces with a permalloy or iron-silicon steel etc. in which only construction material has soft magnetism with same gestalt, choosing according to a use is desirable. As flat state (or needlelike) soft magnetic material powder which can be used for composition of an insulating soft magnetism layer, a permalloy with big high frequency amplitude permeability can be mentioned as the typical raw material, and a thing large (5:1 or more [About]) enough of a powdered aspect ratio is desirable.

[0019]As an organic binder used for formation of an insulating soft magnetism layer, Thermoplastics or those copolymers, such as polyester system resin, polyvinyl-chloride system resin, polyvinyl petit RARU resin, polyurethane resin, cellulose type resin, nitril butadiene series rubber, and styrene butadiene series rubber, Thermosetting resin, such as EPOSHIKI resin, phenol resin, amide system resin, and imide system resin, etc. can be mentioned.

[0020]As for dielectric powder used for formation of a dielectric layer, what has the frequency characteristic of large ** and a dielectric constant whose dielectric constant in a high frequency region is comparatively flat is preferred. For example, barium titanate series ceramics, titanic acid zirconic acid system ceramics, lead perovskite system ceramics, etc. can be mentioned.

[0021]

[Example]The example of the electromagnetic-wave-interference repressor of this invention is described based on figures. As the 1st example is shown in drawing 1, the electromagnetic-wave-interference repressor 1 has the insulating soft magnetic material layer 3 provided in both sides of the conductive substrate (or conductive soft magnetism base material which has soft magnetism) 2, and this conductive substrate 2. The insulating soft magnetic material layer 3 contains the flat state or needlelike soft magnetic material powder 5 and the organic binder 4.

[0022]Here, pure iron was used for the soft magnetic material powder 5. As for the 2nd example, in more than the maximum permeability 450000 (micrometer), the material characteristic used PC permalloy below coercive force:0.015 (Oe) for the soft magnetic material powder 5 more than initial permeability:30000 (mui). Others are the same as Example 1.

[0023]As for the 3rd example, in more than the maximum permeability 150000 (micrometer), the material characteristic used PB permalloy below coercive force:0.05 (Oe) for the soft magnetic material powder 5 more than initial permeability:8000 (mui). Others are the same as Example 1. As the 4th example is shown in drawing 2 (a), as for the electromagnetic-wave-interference repressor 1, the insulating soft magnetic material layer 3 intervenes between the conductive substrate 2 and the dielectric layer 6. The insulating soft magnetic material layer 3 contains the soft magnetic material powder 5 and the organic binder 4 which consist of a permalloy more than the flat or needlelike maximum permeability 150000 (micrometer). The dielectric layer 6 consists of the dielectric powder 7 and the organic binder 4.

[0024]As the 5th example is shown in drawing 2 (b), as for the electromagnetic-wave-interference repressor 1, the dielectric layer 6 intervenes between the conductive substrate 2 and the insulating soft magnetic material layer 3. these each part conductive substrate 2, the insulating soft magnetic material layer 3, and the dielectric layer 6 are the same as the 4th example -- it constitutes.

[0025]The 2nd - the soft magnetic material powder 5 of the 4th example used the thing after annealing

made from MAGNETEIC SHIELD. As a still more concrete example of the 1st example, the electromagnetic-wave-interference repressor 1, The stainless steel network of 24 meshes is used as the conductive substrate (or conductive soft magnetism base material which has soft magnetism) 2, Coating of the soft magnetic material paste which consists of the following presentations was carried out with the doctor blade method so that the overall thickness after desiccation and hardening might be 1.0 mm to these both sides, and curing was performed at 85 ** for 24 hours. The presentation of the insulating soft magnetic material layer 3 provided in both sides of this conductive substrate 2 is as follows.

[0026]

Flat state soft magnetic material impalpable powder .... 90 weight sections Construction material: Pure iron Mean particle diameter: 10 micrometers Aspect ratio : the >5 organic binder 4, Polyurethane resin ..... Eight weight sections Hardening agent (isocyanate compound) ..... The amount part of duplexs Solvent (mixture of cyclohexanone and toluene) .... The presentation of the soft magnetic material powder 5 as a still more concrete example of the 2nd example of 40 weight sections is as follows.

[0027]

flat state soft magnetic material impalpable powder .... 90 weight sections Construction material :P C permalloy Material characteristic maximum permeability: -- more than 450000 (micrometer) initial permeability: -- more than 30000 (mui) -- coercive force:0.015 (Oe) -- the following is the same as Example 1.

[0028]The presentation of the soft magnetic material powder 5 as a still more concrete example of the 3rd example is as follows.

flat state soft magnetic material impalpable powder .... 90 weight sections Construction material :P B permalloy Material characteristic maximum permeability: -- more than 150000 (micrometer) initial permeability: -- more than 8000 (mui) coercive force: -- 0.05 (Oe) -- the following is the same as Example 1.

[0029]As a still more concrete example of the 4th and 5th example, coating of the soft magnetic material paste was carried out with the doctor blade method so that thickness might be 100 micrometers on the surface of a conductive layer base material or an insulating soft magnetic material layer, and curing was performed at 85 ** for 24 hours. The presentation of the dielectric layer 4 is as follows.

[0030]

dielectric powder .... 90 weight sections construction material: -- barium titanate mean-particle-diameter: -- 7 micrometers Organic binder polyurethane resin .... eight weight sections Hardening agent (isocyanate compound) .... the amount part of duplexs A solvent (mixture of cyclohexanone and toluene) .... 45 weight sections.The soft magnetic material paste which constitutes the insulating soft magnetism layer 3 is the same as Example 2 or the example of 3.

[0031]When the thing of above-mentioned Examples 1-5 was inspected using the network analyzer, the result also with a more sufficient penetration level and joint level than the conventional thing was obtained.

[Brief Description of the Drawings]

[Drawing 1]The explanatory view showing the important section of the electromagnetic-wave-interference repressor of the 1-3rd examples.

[Drawing 2]The explanatory view showing the important section of the electromagnetic-wave-interference

repressor of the 4th and 5 example.

[Description of Notations]

1 [-- An organic binder, 5 / -- Soft magnetic material powder, 6 / -- A dielectric layer, 7 / -- Dielectric powder.] -- An electromagnetic-wave-interference repressor, 2 -- A conductive substrate, 3 -- An insulating soft magnetic material layer, 4

[Translation done.]

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審査請求　未請求　請求項の数６　ＯＬ　（全 5 頁）

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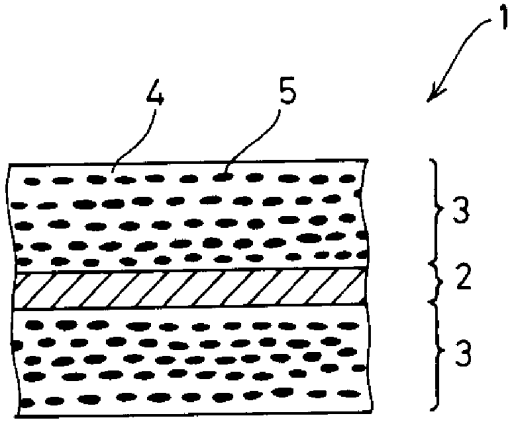
(71)出願人　000242231
北川工業株式会社
愛知県名古屋市中区千代田２丁目24番15号

(72)発明者　北川　弘二
愛知県名古屋市中区千代田二丁目24番15号
北川工業株式会社内

(74)代理人　弁理士　足立　勉

(54)【発明の名称】　電磁波干渉抑制体

(57)【要約】
【課題】本発明は、電磁波透過に対し、導電性のシールド材と同等の遮蔽効果を持っと共に、電磁波の反射による電磁結合を助長させない電磁波干渉抑制体を提供することを目的とする。
【解決手段】導電性支持体２と、この導電性支持体２の少なくとも一方面に設けた絶縁性軟磁性体層３を有し、絶縁性軟磁性体層３は軟磁性体粉末５と有機結合剤４とを含む。絶縁性軟磁性体層３の上面もしくは下面に誘電体層６を有している。前記導電性支持体２が軟磁性を有する導電性軟磁性支持体である。



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【特許請求の範囲】

【請求項１】　電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は純鉄であることを特徴とする電磁波干渉抑制体。

【請求項２】　電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率４５００００（μｍ）以上のパーマロイであることを特徴とする電磁波干渉抑制体。

【請求項３】　電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率１５００００（μｍ）以上のＰＢパーマロイであることを特徴とする電磁波干渉抑制体。

【請求項４】　電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率１５００００（μｍ）以上、初透磁率８０００（μｉ）以上、保磁力０．０５（Ｏｅ）以下のＰＢパーマロイであることを特徴とする電磁波干渉抑制体。

【請求項５】　電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率４５００００（μｍ）以上、初透磁率３００００（μｉ）以上、保磁力０．０１５（Ｏｅ）以下のＰＣパーマロイであることを特徴とする電磁波干渉抑制体。

【請求項６】　請求項１～５のいずれか記載の電磁波干渉抑制体において、
前記絶縁性軟磁性体層の少なくとも一方面に、誘電体粉末と有機結合剤とを含む誘電体層を設けたことを特徴とする電磁波干渉抑制体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、電磁波干渉抑制体に関し、特に高周波領域において不要電磁波の干渉によって生ずる電磁障害を抑制するために用いられる電磁波干渉抑制体に係わる。

【０００２】

【従来の技術】従来から、デジタル電子機器等の高周波

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を利用する電子機器類（電子装置）が用いられているが、中でも準マイクロ波を使用する通信機器類の普及がめざましい。例えば、携帯電話に代表される移動体通信機器は、特に小型化並びに軽量化の要求が強く、高密度実装化が技術課題とされている。

【０００３】従って、過密に実装された電子部品類やプリント配線には、信号処理の高速化が図られているため、静電及び電磁結合による線間結合の増大化や放射ノイズによる干渉などが生じ、電子機器の正常な動作を妨げている。このような電磁障害に対して、従来は回路の出力端子毎にローパスフィルタ等を接続し、不要な高周波電流を抑制したり、問題となる回路を遠ざけるような方策を講じたりして電磁障害の原因となる電磁結合や不要輻射或は導電ノイズ等を抑制している。

【０００４】これら高周波電子機器は、さらに小型化並びに軽量化され、その具体策として、例えば、１枚のプリント配線基板に電力回路と小信号回路を混在させたり、回路毎に小基板化し、それらを重ね合わせて実装するといった手段が多くとられている。

【０００５】

【発明が解決しようとする課題】しかし、複数の配線基板を重ね合わせて実装すると、部品間や配線基板間の電磁波干渉に起因する電磁障害の起こる可能性が高くなり対策が必要となる。これらの配線基板間の電磁波干渉対策手段として、一般的に、銅板又はアルミニウム板等の導電性のシールド材を配線基板間に挿入することが行われている。配線基板では、部品実装密度が高くなっているために、高周波磁界波はノイズ源に対して低インピーダンスとなっており、配線基板の相互間隔も接近して配置されている。

【０００６】従って、ノイズ源となる一方の配線基板に対向する他方の配線基板に対する遮蔽効果は期待できるものの、同じ基板面に対しては、不要輻射の反射が生じてしまい、ノイズ源側の同一配線基板内で二次的な電磁結合が助長されるという問題がある。

【０００７】そこで、本発明は、電磁波の透過に対し、導電性のシールド材と同等の遮蔽効果を持つと共に、電磁波の反射による電磁結合を助長させない電磁波干渉抑制体を提供することを目的とする。

【０００８】

【課題を解決するための手段、発明の実施の形態及び発明の効果】上記目的を達成するためになされた本発明は、請求項１記載のように電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は純鉄であることを特徴とする。

【０００９】請求項２記載の発明は、電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体

の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率４５００００（μｍ）以上のパーマロイであることを特徴とする。

【００１０】ここで、従来のパーマロイはＰＢパーマロイの最大透磁率３００００（μｍ）以上、ＰＣパーマロイの最大透磁率１２００００（μｍ）以上である。従って、パーマロイの中でも最大透磁率の特に大きいものを用いる。請求項３記載の発明は、電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率１５００００（μｍ）以上のＰＢパーマロイであることを特徴とする。

【００１１】ここで、従来のＰＢパーマロイは最大透磁率３００００（μｍ）以上である。従って、ＰＢパーマロイの中でも最大透磁率の特に大きいものを用いる。請求項４記載の発明は、電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率１５００００（μｍ）以上、初透磁率８０００（μｉ）以上、保磁力０．０５（Ｏｅ）以下のＰＢパーマロイであることを特徴とする。

【００１２】ここで、従来のＰＢパーマロイは最大透磁率３００００（μｍ）以上、初透磁率３０００（μｉ）以上、保磁力０．１７（Ｏｅ）以下である。従って、ＰＢパーマロイの中ても最大透磁率と初透磁率の特に大きいもので、しかも保磁力の低いものを用いる。

【００１３】請求項５記載の発明は、電磁障害を抑制する電磁波干渉抑制体の導電性支持体と、該導電性支持体の少なくとも一方面に設けられた絶縁性軟磁性体層とを有し、該絶縁性軟磁性体層は軟磁性体粉末と有機結合剤とを含む電磁波干渉抑制体において、前記軟磁性体粉末は最大透磁率４５００００（μｍ）以上、初透磁率３００００（μｉ）以上、保磁力０．０１５（Ｏｅ）以下のＰＣパーマロイであることを特徴とする。

【００１４】ここで、従来のＰＣパーマロイは最大透磁率１２００００（μｍ）以上、初透磁率３００００（μｉ）以上、保磁力０．０２０（Ｏｅ）以下である。従って、ＰＣパーマロイの中でも最大透磁率と初透磁率の特に大きいもので、しかも保磁力の低いものを用いる。

【００１５】請求項６記載の発明は、請求項１～５のいずれか記載の電磁波干渉抑制体において、前記絶縁性軟磁性体層の少なくとも一方面に、誘電体粉末と有機結合剤とを含む誘電体層を設けたことを特徴とする。本発明によると、電磁波干渉抑制体は、導電性基材（導電性支持体）の片側もしくは両面に絶縁性軟磁性体層が設けられたものを基本構成としている。即ち、複数の配線基板が重ね合って実装されている場合においては、電磁波干渉抑制体を配線基板間に挿入することにより、導電性基材がノイズ源となる一方の配線基板に対向する他の配線基板に対して遮蔽効果が働き電磁波干渉が抑制される。

【００１６】一方、導電性基材を配線基板間に挿入することにより生じる不要輻射の反射による電磁結合の増大化は、軟磁性体粉末と有機結合剤からなる絶縁性軟磁性体層により抑制される。この絶縁性軟磁性体層は、本来、導電性物質である軟磁性金属を微細粉末化し、絶縁性の有機結合剤と混練・分散することにより絶縁層となっていると共に、誘電体層の存在しない誘電体粉末の軟磁性層への混合により空間とのインピーダンス整合が図られるため、軟磁性層表面での不要輻射の反射が起こり難くなる。

【００１７】この電磁波干渉抑制体において、導電性支持体としては、銅薄板、ステンレス薄板、アルミニウム薄板等の金属薄板、及びそれらに微細な穴開け加工を施したパンチングメタル、或は薄板に微細な切れ目を施した後に、延伸加工したいわゆるエキスパンドメタル、或は細線状の導体を網目状に加工した金網等を使用できる。

【００１８】同様の形態にて材質のみが軟磁性を有するパーマロイ或は鉄－珪素鋼等に代えれば、特に比較的低い周波数での電磁干渉抑制効果の高まりが期待できるので、用途に応じて選択するのが望ましい。絶縁性軟磁性層の構成に用いることのできる偏平状（もしくは針状）の軟磁性体粉末としては、高周波透磁率の大きなパーマロイをその代表的素材として挙げることができ、粉末のアスペクト比は十分に大きい（おおよそ５：１以上）ことが望ましい。

【００１９】絶縁性軟磁性層の形成に用いる有機結合剤としては、ポリエステル系樹脂、ポリ塩化ビニール系樹脂，ポリビニルブチラール樹脂，ポリウレタン樹脂，セルロース系樹脂，ニトリルーブタジェン系ゴム，スチレンーブタジェン系ゴム等の熱可塑性樹脂或はそれらの共重合体や、エポシキ樹脂，フェノール樹脂，アミド系樹脂，イミド系樹脂等の熱硬化性樹脂等を挙げることができる。

【００２０】誘電体層の形成に用いる誘電体粉末は、高周波領域での誘電率が大く、かつ誘電率の周波数特性が比較的平坦なものが好ましい。例えば、チタン酸バリウム系セラミック、チタン酸ジルコン酸系セラミック、鉛ペロブスカイト系セラミック等を挙げることができる。

【００２１】

【実施例】本発明の電磁波干渉抑制体の実施例を図に基づいて説明する。第１実施例は、図１に示すように、電磁波干渉抑制体１は、導電性支持体（もしくは軟磁性を有する導電性軟磁性支持体）２と、この導電性支持体２

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の両面に設けられた絶縁性軟磁性体層３を有している。又、絶縁性軟磁性体層３は偏平状又は針状の軟磁性体粉末５と有機結合剤４とを含む。

【００２２】ここで、軟磁性体粉末５に純鉄を用いた。第２実施例は、軟磁性体粉末５を物質特性が最大透磁率４５００００（μｍ）以上、初透磁率：３００００（μｉ）以上、保磁力：０．０１５（Ｏｅ）以下のＰＣパーマロイを用いた。他は実施例１と同じである。

【００２３】第３実施例は、軟磁性体粉末５を物質特性が最大透磁率１５００００（μｍ）以上、初透磁率：８０００（μｉ）以上、保磁力：０．０５（Ｏｅ）以下のＰＢパーマロイを用いた。他は実施例１と同じである。

第４実施例は、図２（ａ）に示すように、電磁波干渉抑制体１は、導電性支持体２と誘電体層６との間に絶縁性軟磁性体層３が介在している。絶縁性軟磁性体層３は偏平もしくは針状の最大透磁率１５００００（μｍ）以上のパーマロイからなる軟磁性体粉末５と有機結合剤４とを含んでいる。誘電体層６は、誘電体粉末７と有機結合剤４とからなっている。

【００２４】又、第５実施例は、図２（ｂ）に示すように、電磁波干渉抑制体１は、導電性支持体２と絶縁性軟磁性体層３との間に誘電体層６が介在している。尚、これら各部導電性支持体２，絶縁性軟磁性体層３，誘電体層６は、第４実施例と同じ構成している。

【００２５】第２～第４実施例の軟磁性体粉末５はＭＡＧＮＥＴＥＩＣ　ＳＨＩＥＬＤ社製の焼鈍後のものを用いた。第１実施例のさらに具体的な例として電磁波干渉抑制体１は、導電性支持体（もしくは軟磁性を有する導電性軟磁性支持体）２として２４メッシュのステンレス網を用い、この両面に乾燥、硬化後の全厚が１．０ｍｍとなるように以下の組成からなる軟磁性体ペーストをドクターブレード法により塗工し、８５℃にて２４時間キュアリングを行った。この導電性支持体２の両面に設けられた絶縁性軟磁性体層３の組成は次の通りである。

【００２６】

偏平状軟磁性体微粉末　……９０重量部
　材質：純鉄
　平均粒径：１０μｍ
　アスペクト比：＞５

有機結合剤４は、

ポリウレタン樹脂　……８重量部
硬化剤（イソシアネート化合物）　……２重量部
溶剤（シクロヘキサノンとトルエンとの混合物）……４０重量部

第２実施例のさらに具体的な例としての軟磁性体粉末５の組成は次の通りである。

【００２７】

偏平状軟磁性体微粉末　……９０重量部
　材質：ＰＣパーマロイ
　物質特性
　　最大透磁率：４５００００（μｍ）以上
　　初透磁率：３００００（μｉ）以上、
　　保磁力：０．０１５（Ｏｅ）以下

他は実施例１と同じである。

【００２８】第３実施例のさらに具体的な例としての軟磁性体粉末５の組成は次の通りである。

偏平状軟磁性体微粉末　……９０重量部
　材質：ＰＢパーマロイ
　物質特性
　　最大透磁率：１５００００（μｍ）以上
　　初透磁率：８０００（μｉ）以上
　　保磁力：０．０５（Ｏｅ）以下

他は実施例１と同じである。

【００２９】第４，第５実施例のさらに具体的な例として、導電層支持体又は絶縁性軟磁性体層の表面に厚さが１００μｍとなるように軟磁性体ペーストをドクターブレード法により塗工し、８５℃にて２４時間キュアリングを行った。誘電体層４の組成は次の通りである。

【００３０】

誘電体粉末　……９０重量部
　材質：チタン酸バリウム
　平均粒径：７μｍ
有機結合剤

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ポリウレタン樹脂　……　８重量部
硬化剤（イソシアネート化合物）　……　２重量部
溶剤（シクロヘキサノンとトルエンとの混合物）……４５重量部

尚、絶縁性軟磁性層３を構成する軟磁性体ペーストは、実施例２又は３の具体例と同じである。

【００３１】上述の実施例１～５のものを、ネットワークアナライザを用いて検査したところ透過レベルも結合レベルも従来のものよりよい結果が得られた。

【図面の簡単な説明】

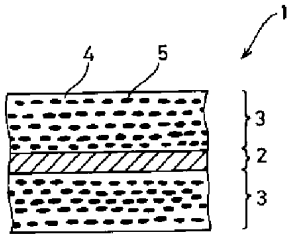
【図１】　第１～３実施例の電磁波干渉抑制体の要部を表す説明図。

【図２】　第４，５実施例の電磁波干渉抑制体の要部を表す説明図。

【符号の説明】

１…電磁波干渉抑制体、２…導電性支持体、３…絶縁性軟磁性体層、４…有機結合剤、５…軟磁性体粉末、６…誘電体層、７…誘電体粉末。

【図１】



【図２】